REMARKS

Applicant respectfully requests reconsideration of this application as amended. Claims 1-3, 5-16, 18-21, 23-46, 48-53, 55-60, 62-67, 69-72, and 74-75 remain in this application. Claims 1, 7, 13, 14, 18, 24, 31, 37, 43, 50, 57, 64, and 71 have been amended. No claims have been canceled. No new claims have been added.

Rejections under 35 U.S.C. § 103(a)

The Office Action rejected claims 1-3 and 5-6 under 35 U.S.C. § 103(a) as being unpatentable over Golmie et al., "A Differentiated Optical Services Model for WDM Networks" (hereinafter "Golmie") in view of Assi et al., "Optical Networking and Real-Time Provisioning: An integrated Vision for the Next-Generation Internet" (hereinafter "Assi") and Kodialam et al., US Patent Application Publication No. 2002/0018264 A1 (hereinafter "Kodialam").

Golmie describes "a QoS service model in the optical domain ... based on a set of optical parameters that captures the quality and reliability of the optical lightpath." (Golmie, Abstract and Table 1.) An optical lightpath being "an optical communication channel, traversing one or more optical links, between a source-destination pair." (Golmie, Page 69, Left column.) Golmie classifies lightpaths (not wavelengths or paths) based on QoS and these classes for example "consist[] of three alternate lightpaths between a single source-destination pair accessible at the WADM, each with a unique DoS class, labeled class 1, class 2, and class 3, containing wavelength groups (λ_1, λ_2), (λ_3, λ_4), and (λ_5, λ_6) respectively... All lightpaths in a DoS class have equivalent quality of optical service between a source-destination pair." (Golmie, page 72, Left column.) Golmie does not describe determining service level topologies. (See Office Action, page 3.)

Assi describes two dynamic algorithms to help with the so-called "routing and wavelength assignment (RWA) problem." (Assi, page 38, right column.) In both

algorithms, a network with multiple nodes/OXCs (without wavelength conversion) is interconnected and "all nodes maintain a synchronized and identical topology and link state information (traffic engineering database, TED)." (Assi, page 39, right column.) "[T]he network is represented by W identical graphs, each conforming to the physical topology and a particular wavelength." (Assi, page 40, left column.) "For a given connection request, a constraint route is calculated, for each of the wavelength graphs, throughout the entire network from source to destination, typically using a shortest path algorithm but with link weights adjusted to attain some sort of local resource optimization." (Assi, page 40, left column.) Accordingly, each node of the network has the same physical topology database for the network. These nodes do not store what paths or wavelengths are available from a given node's perspective. Rather, in response to a connection request, all of the different paths from a source node to a destination node are calculated on the fly and the best path chosen from the calculated paths.

Kodialam describes "dynamic routing (IDR) of service level (e.g., bandwidth) guaranteed paths for network tunnel paths..." (Kodialam, Abstract.) "IDR determines whether to route an arriving request for a network tunnel path over the existing topology or to open a new, available optical wavelength path." (Kodialam, Abstract.) "[E]ach LSP [label switched path] determined route is computed at the local ingress router without communication with a domain or area wide router-server in communication with all routers of the nodes in the network....In employing OSPF and its extension, the topology information may be derived from the link sate database, with residual capacities derived using messaging and signaling methods..." (Kodialam, Paragraph 0041.) The network of Kodialam may have OXCs with or without wavelength conversion capability. (Kodialam, Paragraphs 0045-0046.) Kodialam discloses layering a logical internet protocol (IP) network over the physical optical network.

Holender discloses establishing a set of logical networks on top of a physical electrically switched network, such as Asynchronous Transfer Mode (ATM) networks

(Holender, col. 5, lines 43-48). Each logical network is logically separated from the other logical networks. (Holender, Col. 3, lines 61-67).

Thus, the combination of Golmie, Kodialam, Holender, and Assi is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node.

Thus, this combination does not describe claim 1, as amended:

> applying a set of one or more connectivity constraints that include quality of service (QoS) based criteria on a physical network topology of a wave length division multiplexing optical network to divide said optical network into separate service levels, wherein the connectivity constraints are based on a conversion criteria; and
>
> determining service level topologies for each of said service levels for each node in the optical network,, wherein each service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level.

(Claim 1, as amended) As stated in the Office Action, the Examiner admits that Golmie does not teach or suggest determining service level topologies. (Office Action, Page 2.) Thus, Golmie cannot teach or suggest a service level topology associated with connectivity constraints based on a conversion criteria. Kodialam simply describes that a network could have either conversion free OXCs or conversion OXCs and layers an IP

network over an optical network. Assi describes adaptive routing solutions in a conversion free network. Because neither Kodialam nor Assi relate their concepts to a service level, neither Kodialam nor Assi teach or suggest a service level topology associated with connectivity constraints based on a conversion criteria. Holender discloses simply describes partitioning an electrically switched network into logical networks and does not disclose determining service level topologies in an optical network. Because Holender does not disclose an optical network, Holender cannot teach or suggest a service level topology associated with connectivity constraints based on conversion criteria.

Furthermore, the Examiner cites the Applicant's specification as support that a smaller service level topology is known in the prior art. (Office Action, page 20). However, the Examiner's cite is from the Applicant's detailed description, and not part of the background. As such, this cite is not an admission that a smaller service topology is known in the prior art. Furthermore, Applicant states in the background that adding quality of service type information makes a network topology database larger, not smaller. (Specification, paragraph 17).

The above quoted limitations are not described or suggested by Golmie, Kodialam, Assi, or Holender. While there are various uses for the invention as claimed, several such uses are discussed in Figure 3A-3C and paragraphs 0064-0069. Thus, while the invention is not limited to the uses discussed on these pages, it should be understood that Golmie, Kodialam, Assi, and/or does not enable these uses and the above quoted limitations do.

Accordingly, the combination of Golmie, Kodialam, Assi, and Holender does not describe what Applicants' claim 1 requires. Claims 2-3 and 5-6 are dependent upon claim 1 and are therefore allowable for at least the same reason.

The Office Action rejected claims 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Golmie in view of Kodialam and Holender. The combination of Golmie and Kodialam does not describe what Applicants are claiming.

Thus, the combination of Golmie, Holender, and Kodialam is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine physical network topologies for the entire system. As per above, none of Golmie, Kodialam or Holender teach or suggest that a service level topology based on a conversion criteria as claimed. However, claim 7 requires "for each of said plurality of service levels, maintaining service level topology from each node to other nodes of the wave length division multiplexing optical network based on a conversion criteria, wherein each service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level."

Accordingly, the combination of Golmie, Holender, and Kodialam does not describe what Applicants require in claim 7. Claims 8-9 are dependent upon claim 7 and are therefore allowable for at least the same reason.

The Office Action rejected claims 14-16 under 35 U.S.C. § 103(a) as being unpatentable over Golmie in view of Assi, Kodialam and Holender.

Thus, the combination of Golmie, Kodialam, Assi, and Holender is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. As per above, none of Golmie, Kodialam, Assi, or Holender teach

or suggest that separate service level topologies based on a conversion criteria. For example, claim 14 requires, "... at least one separate network topology database for each of said plurality of service levels that represents the connectivity between nodes of said optical network using those of the wavelengths that qualify for that service level, wherein each access node of said optical network stores a separate one of said network topology databases for each of said plurality of service levels, and wherein each service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level<u>, wherein the separate network topology databases are based on a conversion criteria</u>."

Accordingly, the combination of Golmie, Kodialam, and Assi does not describe what Applicants' claim 14 requires. Claims 15-16 are dependent upon claim 14 and are therefore allowable for at least the same reason.

The Office Action rejected claims 18-21, 24-25, 31-32, 34, 43-47, and 49 under 35 U.S.C. § 103(a) as being unpatentable over Golmie in view of Assi, Kodialam, and Holender.

The combination of Golmie, Kodialam, Assi, and Holender is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical <u>lightpath</u> (not paths and wavelengths individually) and uses <u>OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network.</u> In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node. However, as per above, <u>the combination does not teach or suggest a service level topology structure based on a conversion criteria</u>.

The combination does not describe what Applicants' claims 18, 24, 31, and 43 require. For example, claim 18, as amended, requires "for each access node of said optical network, a service level topology structure based on a conversion criteria for each of said plurality of service levels representing connectivity of that access node to others of said access nodes using wavelengths from the link service level channel sets of that service level, wherein each access node stores those of said service level topology structures representing connectivity of that access node, and wherein said topology structures is smaller than a physical network topology of said optical network."

Furthermore, claim 24, as amended, requires "a service level connectivity database to store, for each of said set of service levels, a service level topology structure based on a conversion criteria that stores a representation of the service level topology of that service level for said access node, wherein the service level topology is smaller than a physical network topology of said optical network."

In addition, claim 31, as amended, requires "for each of said plurality of service levels, instantiate a service level topology structure based on a conversion criteria, wherein each service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level."

Claim 43, as amended, requires "selecting a first of a plurality of service level, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network, wherein the different service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level and wherein the different service level topology is based on a conversion criteria ...".

Accordingly, the combination of Golmie, Assi, Kodialam, and Holender does not describe what Applicants require in claims 18, 24, 31, and 43. Claims 19-23, 25-30, 32-36, 44-47, and 49 are dependent upon claim 18, 24, and 31 are therefore allowable for at least the same reason.

The Office Action rejected claims 37-38, 40, 50-53, 56, and 71-73 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, Holender, and Kodialam as applied to claims 18-20, 22, 24-25, 31-32, and 34, and further in view of Freeman, "Telecommunication System Engineering" (hereinafter "Freeman"). Freeman describes to store method steps as program memory for providing instructions to a controller or computer.

The combination of Golmie, Kodialam, Assi, Holender, and Freeman is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical <u>lightpath</u> (not paths and wavelengths individually) and <u>uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network.</u> In this model, each node has the same database that contains <u>information about the all of the nodes of entire network</u> and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node. However, as per above, <u>the combination does not teach or suggest a service level topology structure based on a conversion criteria.</u>

The combination does not describe what Applicants' claims 37, 50, and 71 require. For example, claim 37, as amended, requires "... for each of said plurality of service levels, <u>instantiate a service level topology structure based on a conversion criteria</u>, wherein each service level topology is a network topology smaller than the physical network topology and said each service level topology comprises connectivity between pairs of nodes only for the corresponding service level ..."

Furthermore, claim 50, as amended, requires "responsive to receiving a request for a communication path starting at a source node in an wavelength division multiplexing optical network, selecting a first of a plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network, where the different service level topology is based on a conversion criteria; selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from the source node to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level, and wherein said separate service topology structure is smaller than a physical network topology of said optical network".

In addition, claim 71, as amended, requires "a service level connectivity database for an access node of a wave division multiplexing optical network, wherein each link of said optical network includes a set of zero or more lamdas for each of a plurality of service levels, each of said plurality of service levels includes a set of zero of more possible end to end paths comprised of a series of one or more links that include one or more lamdas of that service level, wherein the service level connectivity database includes a separate service level topology structure for each of said plurality of service levels, wherein said separate service topology structure is smaller than a physical network topology of said optical network, said separate service topology structure is based on a conversion criteria, each of said plurality of service level topology structures storing the data for each of the possible end to end paths of that service level that end with said access node, said service level connectivity database including, for each of the possible

end to end paths that end with said access node, data representing, the series of links of that path; and the lamdas of that path."

Accordingly, the combination of Golmie, Assi, Kodialam, and Freeman does not describe what Applicants require in claims 37 and 50. Claims 38-42, 51-53, 55-56, and 72-73 are dependent upon claims 37 and 50 and are therefore allowable for at least the same reason.

The Office Action rejected claims 30, 57-60, and 62-63 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, and Kodialam in view of Melaku et al., US Patent Publication No. 2003/0074443 (hereinafter "Melaku").

Melaku describes rerouting traffic to a different path based on a change in QoS requirements. (Melaku, Paragraph 0056.) "If the user decides to change QoS requirements in the midst of a session, the LMQB [Last Mile QoS Broker] dynamically updates the database [of the LMQB] and re-allocates new resources and establishes a path that meets the requested quality of service." (Melaku, Paragraph 0056.)

The combination of Golmie, Kodialam, Assi, and Melaku is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular

access node. However, the combination does not teach or suggest a service level topology structure based on a conversion criteria.

The combination of Golmie, Assi, Kodialam, and Melaku does not describe what Applicants require in claim 57. For example, claim 57, as amended, requires "receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of said optical network, and wherein said different service level topology is based on a conversion criteria; selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level, and wherein said separate service topology structures is smaller than a physical network topology of said optical network …".

Accordingly, the combination of Golmie, Assi, Kodialam, Holender, and Melaku does not describe what Applicants require in claim 57. Claims 58-60 and 62-63 are dependent upon claim 57 and are therefore allowable for at least the same reason.

The Office Action rejected claims 64-67 and 69-70 under 35 U.S.C. § 103(a) as being unpatentable over Golmie, Assi, Kodialam, Holender, and Freeman in view of Melaku as applied to claims 57-60, and further in view of Freeman.

The combination of Golmie, Kodialam, Assi, Freeman, Holender, and Melaku is a QoS service model in the optical domain based on a set of optical parameters that captures the quality and reliability of an optical lightpath (not paths and wavelengths individually) and uses OSPF-TE to determine the physical network topology for the entire system which is stored in each node of the network. In this model, each node has the same database that contains information about the all of the nodes of entire network and is not specific to just that particular node. This database information would include information about lightpaths separated by class for the entire area and would not be specific to a particular access node. Additionally, this common database may be updated dynamically in each node to reflect QoS changes (each node will note the QoS changes). However, combination does not teach or suggest a service level topology structure based on a conversion criteria.

The combination of Golmie, Kodialam, Assi, Freeman, Holender, and Melaku does not describe what Applicants require in claim 64. For example, claim 64, as amended, requires "responsive to receiving a request to change a service provisioned with a communication path established in a wavelength division multiplexing optical network at one of a plurality of service levels to a different one of said plurality of service levels, selecting a path and a wavelength on said path using a database that stores, for each of the plurality of service levels, a representation of available paths from a source node of said communication path to other access nodes in said optical network and a separate service level topology structure for each of said service level topologies of said source node, wherein different wavelengths on at least certain links of said optical network qualifying for different ones of said plurality of service levels forms a different service level topology for each of said plurality of service levels for each access node of

said optical network, wherein each path is a series of two or more nodes connected by links having a set of one or more wavelengths at the same service level, and wherein said service level topology is based on a conversion criteria and wherein said service topology structures is smaller than a physical network topology of said optical network"

Accordingly, the combination of Golmie, Assi, Kodialam, Freeman and Melaku does not describe what Applicants require in claim 64. Claims 65-67 and 69-70 are dependent upon claim 64 and are therefore allowable for at least the same reason.

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Respectfully submitted,

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